







After the separation of the two relating dewatering belts of the second gap former, the layer created by the second gap former can be introduced into the couching zone together with the outer dewatering belt in which the two layers created in the gap formers are couched together with their sides with a higher content of fines.

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An alternative embodiment of the machine according to the invention is characterized in that one of the two layers couched together with their sides containing a higher content of fines is created by an endless wire former and the sheet formation of this first layer occurs with a higher content of fines on the outer side facing away from the endless wire and that the second layer is created by a gap former and the sheet formation of this second layer occurs with a higher content of fines on the forming element side.

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In this connection, the flow direction of the headbox associated with the gap former advantageously corresponds generally to the travel direction of the first layer created by the endless wire former. The layer created by the gap former is preferably introduced after the separation of the two dewatering belts of the gap formers, together with the outer dewatering belt to the couching zone in which it converges for couching together the two layers with the endless wire. Preferably, the endless wire can be guided in a generally horizontal manner at least in the area of the couching zone.

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At least one additional gap former is provided in a practical embodiment in which the sheet formation of the allocated additional layers with higher content of fines occurs at the forming element side. The additional layer is couched together with the layer created by the first gap former in an additional couching zone. The flow direction of the headbox associated with the additional gap former preferably corresponds to the travel direction of the layer created by the endless wire former.

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In a practical manner, after a separation of the two dewatering belts of the additional gap former the additional layer created by the additional gap former is

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introduced together with the outer dewatering belt of the additional couching zone in which it converges for couching together with the two layers formed by gap formers. Preferably, the endless wire is guided in generally horizontal fashion, at least in the area of the two couching zones.

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For the formation of an at least three-layer to four-layer fibrous web, at least one additional gap former can be provided wherein the sheet formation of the additional layer occurs with a higher content of fines occurs at the forming element side. The additional layer is couching together with the layer created by the preceding gap former in an additional couching zone so that at least one of the two layers with a side having a higher content of fines is couching together with the other layer. The stream direction of the headbox associated with the additional gap former preferably is the same as the flow direction of the fibrous web to be formed.

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A multi-layer headbox and/or a single-layer headbox and/or any combination of various headboxes can each be provided as headbox.

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Uniform pressure dewatering elements can be provided for dewatering the fibrous web, if necessary. They can be embodied, for instance, like the one described in DE 197 33 316 A1.

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The process according to the invention is accordingly characterized in that at least two layers to be couching together each with one side having a higher content of fines, are introduced into the relevant couching zone in such a way that their sides with a higher content of fines are in contact with one another, and in that at least one of the two layers is created by a gap former.

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sub B5 Advantageous embodiments of the process according to the invention are listed in the subclaims.

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~~The invention shall be described in detail below using exemplary embodiments with reference to the drawings, which show:~~

5 Fig. 1 a schematic representation of an embodiment of a machine for producing a multi-layered fibrous web in which both layers to be couched together on their sides with a higher content of fines are each formed by gap formers,

10 Fig. 2 a schematic representation of another embodiment of the machine in which both sides to be couched together on their sides with a higher content of fines are formed by a gap former, in which another, first layer is formed by an endless wire former

15 Fig. 3 a schematic representation of another embodiment of the machine in which the first of the two layers to be couched together on their sides with a higher content of fines is formed by an endless wire former and the second layer is formed by a gap former.

20 Fig. 4 a schematic representation of another embodiment of the machine comparable to the one in Fig. 3 in which another gap former is provided for the formation of another layer, here third, layer, and

25 Fig. 5 a schematic representation of another embodiment, using that of Fig. 2 solely by way of example in which an additional gap former is provided for the formation of an additional layer, here fourth, layer.

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Figs. 1 through 5 depict various embodiment of a machine for producing a multi-layered fibrous web, in particular a paper or cardboard web, in which the layers formed by each former are couched together, i.e., are connected.

30 The various embodiments have in common that each of the two layers to be





As can be seen in Fig. 2, in the present case the outer dewatering belt 16 of the first gap former 10 is separated from the inner dewatering belt 14 and the relevant layer B in front of the deflection roll 28 in the web travel direction L. Accordingly, this layer B is guided here only together with the inner dewatering belt 14 around the deflection roll 28. Then, in the area of the deflection roll 28, the first layer A formed in the endless wire former 34 and the second layer B formed in the first gap former 10 are couched together.

The layer C formed by the second gap former 12 is introduced into the couching zone 30 after a separation of the two dewatering belts 14', 16' of the second gap former together with the outer dewatering belt 16', in which zone the two layers B, C formed in the gap formers 10, 12 are then couched together at their sides with a higher content of fines.

As opposed to the embodiment according to Fig. 1, here the layer formed by the first gap former 10, i.e., here the layer B, is not introduced into the couching zone 30 by the outer belt of the first gap former 10 but rather by the endless wire 36, upon which previously another layer, i.e., the first layer A, had already been formed. The design as well as the relative position of the two gap formers 10, 12 is generally equivalent to the embodiment according to Fig. 1 in which related parts were assigned the same reference characters. The couching of the two layers B, C formed by the gap formers 10, 12 can occur in an area of a couching roll 32 wrapped by the outer dewatering belt 16' of the second gap former 12.

Fig. 3 depicts in a schematic representation another embodiment of a machine for the production of a multi-layered, here again two-layered, fibrous web. In this case the first layer A of the two layers A, B to be couched together at their sides of higher content of fines is formed by a continuous wire 38. Here, the sheet formation of this first layer A occurs with a higher content of fines on the side facing away from the continuous wire 40. The second layer B is formed by a gap former 12 whose design corresponds to that of the second gap former 12 of the embodiment according to Fig. 1. The sheet formation

of the second layer B again occurs with a higher content of fines on the forming element side, i.e., on the side of the forming roll 20'.

5 The stream direction of the headbox 24' associated with the gap former 12 corresponds in general to the web travel direction LA of the first layer A formed by the fourdrinier former 38.

10 The layer A formed by the gap former 12 is introduced into the couching zone 30 after the separation of the two dewatering belts 14', 16' of the gap former together with the outer dewatering belt 16', in which zone it is brought together with the continuous wire 40 for the couching of the two layers A, B with their sides of higher content of fines. The resulting distribution of fines is depicted symbolically in Fig. 3 at the right side.

15 As discernible in Fig. 3 the continuous wire 40 is guided in general horizontally from the correlating headbox 42 beyond the couching zone 30.

20 The embodiment depicted in Fig. 4 is different from the one in Fig. 3 in that another gap former 44 is provided for the creation of a three-layered fibrous web. In the present case, this gap former corresponds in both design and orientation to the gap former 12 that forms the second layer B. The sheet formation of the third layer C again occurs with the higher content of fines on the forming element side.

25 The third layer C and the second layer B formed by the preceding gap former 12 are couched together with their sides of higher content of fines in another couching zone 46.

30 The stream direction of the headbox 48 associated with the additional gap former 44 corresponds to the travel direction LA of the first layer A formed by the fourdrinier former 38. The third layer C formed by the additional gap former 44 is guided, after the separation of the two dewatering belts 50, 52 of the additional gap former 44, together

with the outer dewatering belt 52 to the additional couching zone 46, in which it is brought together with the continuous wire 40 in order to couch together the two layers B, C formed by the gap formers 12, 44.

5           The continuous wire 40 is guided beginning at the headbox 42 of the fourdrinier former 38 past the first couching zone 30 as well as past the second couching zone 46 in general horizontally and then it is guided back to the headbox 42 via deflection rolls.

10           Fig. 5 depicts schematically another embodiment, only by way of example based on Fig. 2, in which an additional gap former 54 is provided for the formation of another, here fourth, layer D. In the present case, this additional gap former 54 is positioned behind the two provided gap formers 10, 12 in the machine travel direction according to the embodiment of Fig. 2.

15           The sheet formation of the additional layer D occurs with a higher content of fines on the forming element side.

20           The design and orientation of the additional gap former 54 correlate in the present case to those of the preceding gap formers 12 that form the third layer C.

25           The fourth layer D is couched together with the third layer C formed by the preceding gap former 12 in an additional couching zone 56, in which at least one of the two layers C, D, in the present case the fourth layer D, is couched together with the other layer at a side with a higher content of fines.

30           The flow direction of the headbox 58 associated with the additional gap former 54 is the same as the travel direction of the fibrous web being formed, i.e., in the present case, the travel direction LA of the first layer A formed by the fourdrinier former 34.

Such an arrangement avoids the couching together of two sides with lower

content of fines in the case of an additional layer D.

The resulting distribution of fines is depicted symbolically on the right side of Fig. 5. Generally, additional gap formers are possible as well.

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As discernible from Fig. 5 the continuous wire 36 is guided essentially in a horizontal direction beginning at the headbox of the fourdrinier former 34 over the first couching zone provided in the area of the deflection roll 28 of the gap former 10 as well as over the couching zone 30, in which the layers B and C are couched together with their sides having a higher content of fines, and beyond the additional couching zone 56. Then the continuous wire 36 is guided back to the headbox of the fourdrinier former 34. The present embodiment has the same design as the one of Fig. 2 in other respects as well.

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The extension with at least one gap former, depicted in Fig. 5 for instance, is also possible in the preceding embodiments.

In all cases the headboxes can be provided as multi-layered headboxes or as single-layered headboxes.

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If necessary, uniform pressure dewatering elements can be used for dewatering the fibrous web. They can be designed, for instance, such as the ones described in DE 197 33 316 A1.

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List of Reference Characters

CODE OF SHEETS

	10	Gap former
	12	Gap former
5	14	Inner dewatering belt
	14'	Inner dewatering belt
	16	Outer dewatering belt
	16'	Outer dewatering belt
	18	Headbox nip
10	18'	Headbox nip
	20	Forming roll
	20'	Forming roll
	22	Breast roll
	22'	Breast roll
15	24	Headbox
	24'	Headbox
	26	Forming shoe
	26'	Forming shoe
	28	Deflection roll
20	30	Couching zone
	32	Couching roll
	34	Fourdrinier former
	36	Continuous wire
	38	Fourdrinier former
25	40	Continuous wire
	42	Headbox
	44	Additional gap former
	46	Couching zone
	48	Headbox
30	50	Inner dewatering belt

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- 52 Outer dewatering belt
- 54 Additional gap former
- 56 Additional couching zone
- 58 Headbox

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- A Layer
- B Layer
- C Layer
- D Layer

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- L Web travel direction
- LA Travel direction of the first layer

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